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(43) Application published 13 Mar 1985

(22) Date of filing 26 Jul 1984

(30) Priority data

(31) 522758

(32) 12 Aug 1983

(33) US

(51) INT CL⁴
B61F 5/30

(52) Domestic classification
B7L 156 159 UE

(56) Documents cited
GB 1573325
GB 1532441
GB 1341354

GB 1073730

GB 0631074

EP A1 0035455

(58) Field of search
B7L

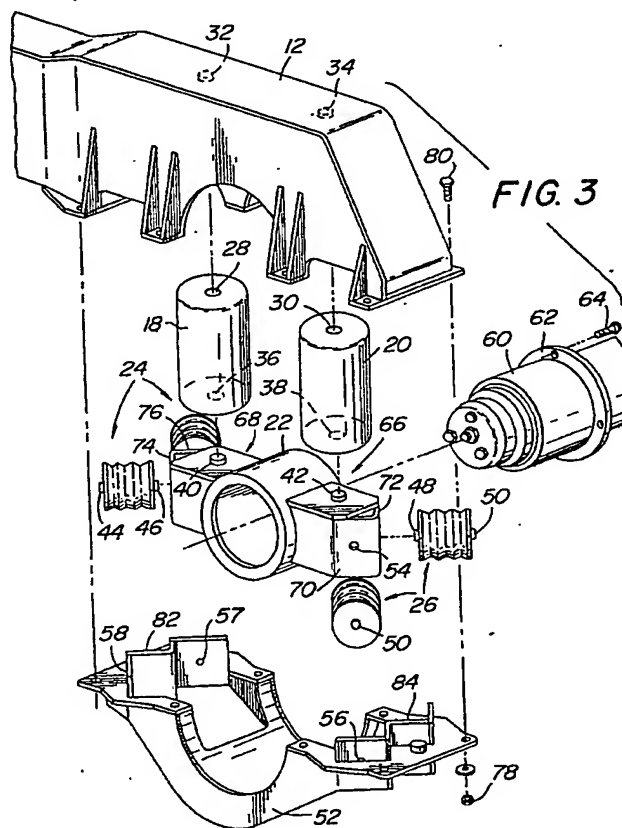
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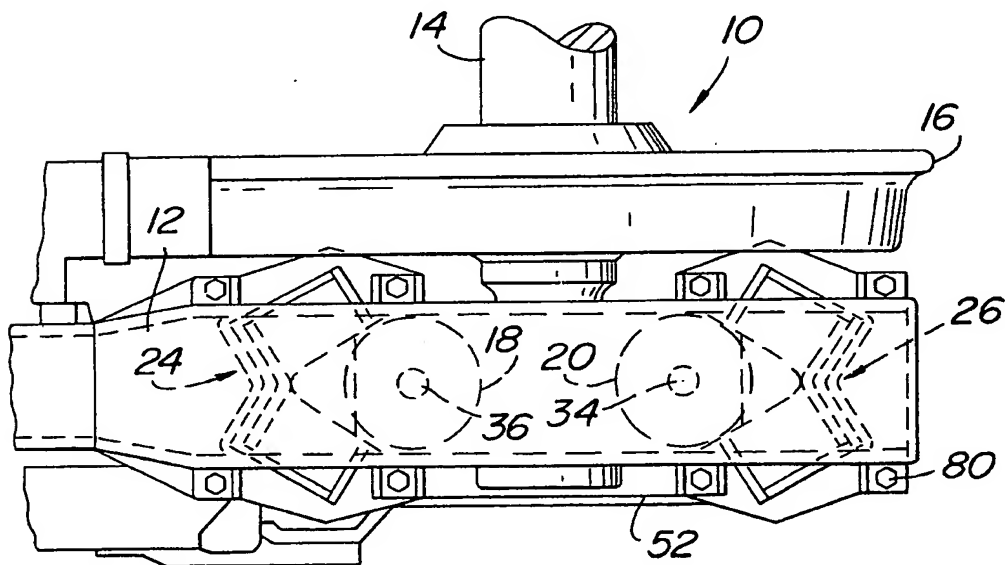
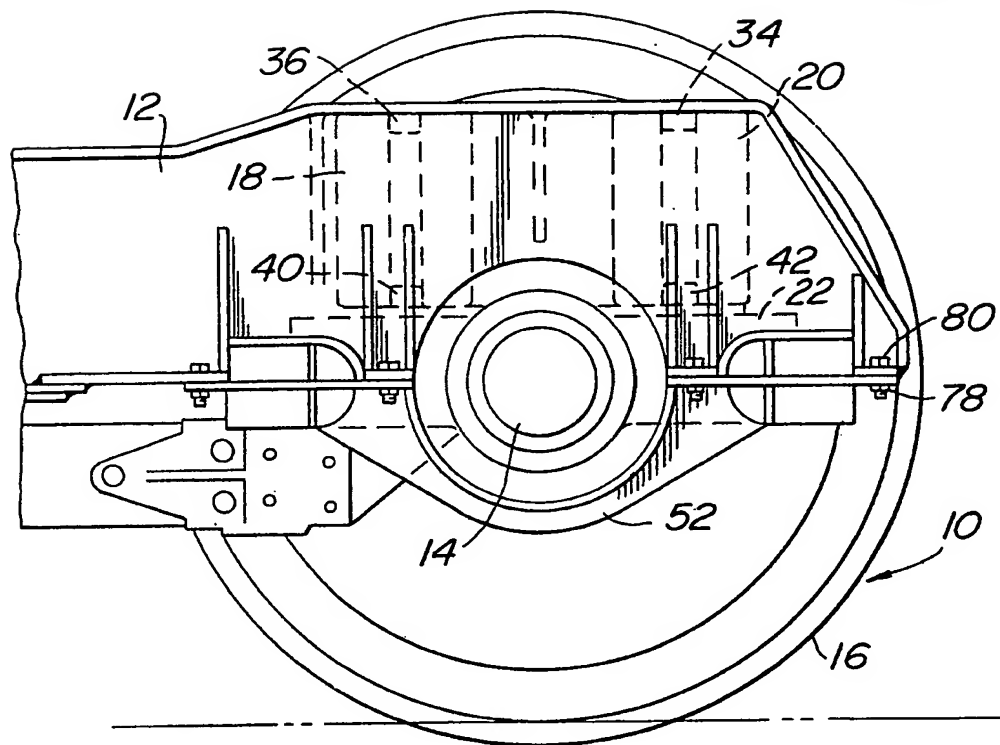
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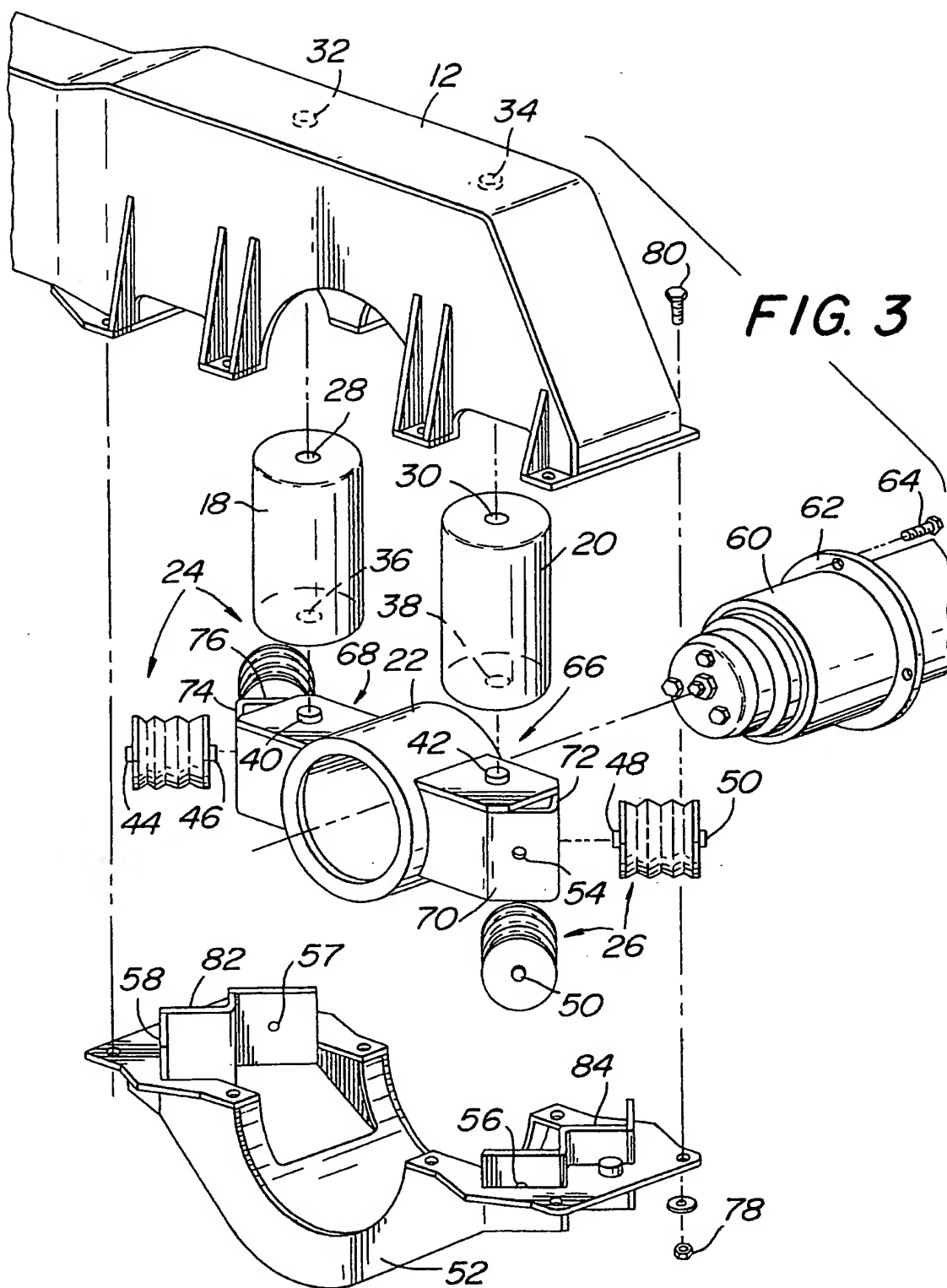
(54) Primary suspension system for a railway car

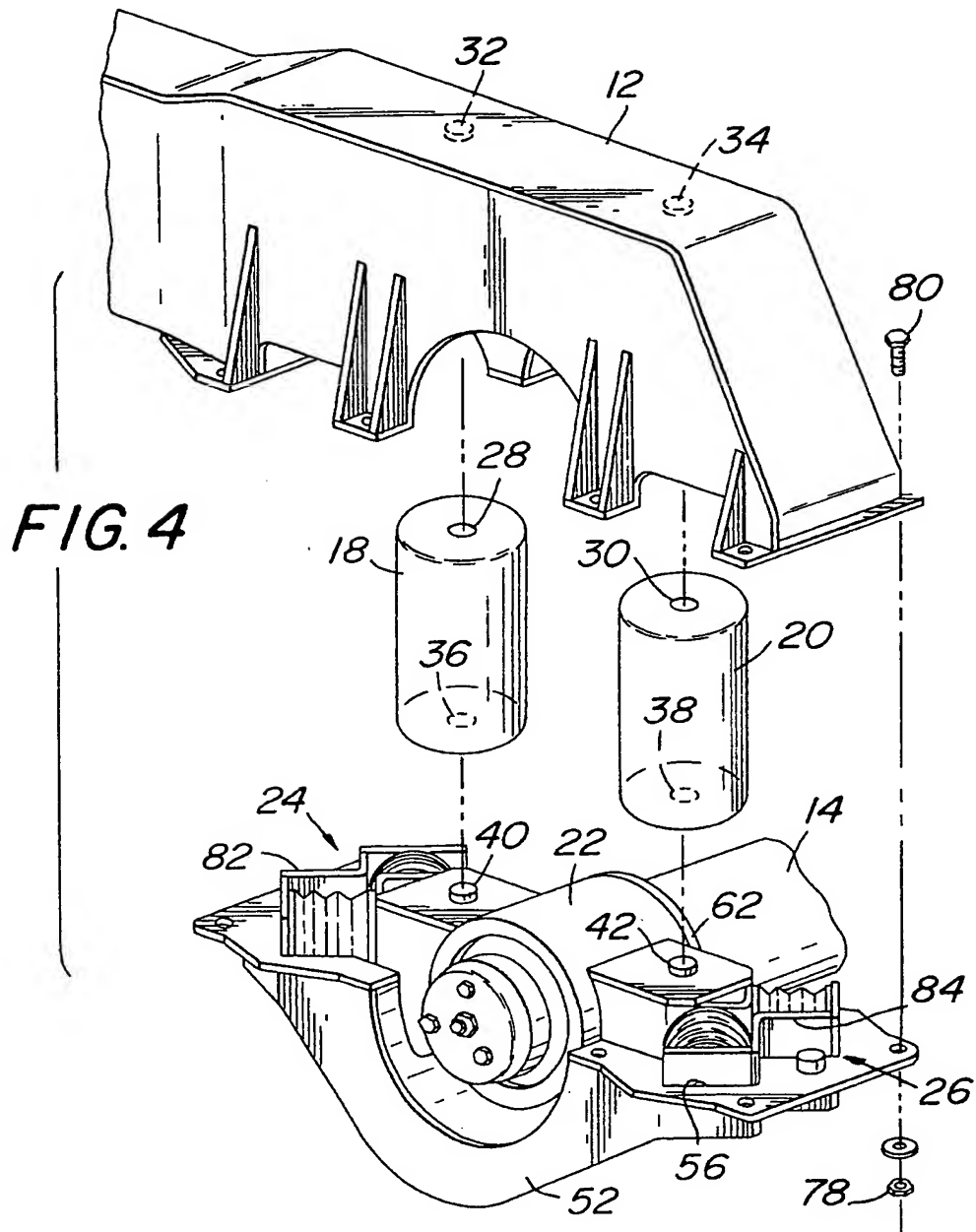
(57) The system includes a pair of longitudinally spaced vertical springs 18,20 connected between a housing 22 including the journal bearing and the side frame 12. Pairs of angularly disposed elastomeric springs 24,26, also connected to the housing, are disposed on opposite sides of the vertical springs to provide lateral and longitudinal stiffness.



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FIG. 1**FIG. 2**





SPECIFICATION

Primary suspension system for a railway car

5 In a railway car, the primary suspension system generally refers to the suspension between the journal bearing assembly and the truck frame. The journal bearing assembly carries a wheel axle unit and acceleration forces generated by the wheel are directed to the primary suspension system with the forces being transmitted through the primary suspension system to the side frame. The secondary suspension system refers to the system between a bolster on the truck and the car body and generally includes air or mechanical springs. The present invention is directed to primary suspension systems.

10 Past primary suspension system have involved elastomeric rings surrounding the journal bearings. Such rings have included cut-away portions to provide softer spring rates and the cut-away portions were designed to provide desired vertical, longitudinal and lateral spring rates. Some of the primary suspension systems used heretofore are described in U.S. Patent 4,044,689, issued August 30, 1977.

25 While the aforementioned systems have proved satisfactory for many applications, the spring elements are subject to wear. Also, the vertical, lateral and longitudinal spring rates are generally related to each other and cannot be independently adjusted.

30 This invention provides a primary suspension system in which the spring rates for different directions may be independently controlled.

It also provides a primary suspension system in which the main parts may be assembled or repaired in areas away from the truck.

35 In accordance with the present invention, a primary suspension system includes a housing for receiving a journal bearing connected to the axle of a wheel axle unit. A pair of longitudinal spaced elastomeric or coil springs are connected between the housing the side frame of a truck to provide vertical springing. Two pairs of longitudinally angularly spaced elastomer spring elements are disposed on opposite ends of the vertical springs to provide lateral and longitudinal springing.

45 The invention is illustrated, by way of example only, by the following description of a preferred embodiment to be taken in conjunction with the accompanying drawings, in which :

50 *Figure 1* is a side view of a portion of the side frame of a railway truck including a primary suspension system, in accordance with the present invention;

55 *Figure 2* is a top view of the portion of the truck illustrated in *Figure 1*; and

Figures 3 and 4 are isometric exploded views of the elements of a primary suspension system, in accordance with the present invention.

60 Referring to *Figures 1 and 2*, a typical railway truck includes wheel-axle units, such as wheel-axle unit 10, suitable attached to a pair of side frames such as the side frame 12. The wheel axle unit 10 includes an axle 14 and a wheel 16.

65 The primary suspension system to which the

present invention relates includes a pair of longitudinally spaced vertical springs 18 and 20 which may be elastomeric or mechanical coils, secured to a housing retainer 22. Pairs of angularly disposed spring members 24 and 26 are also connected to the housing retainer 22 and an opposite sides of the springs 18 and 20.

70 Various elements associated with a typical truck are also illustrated. However, because they are only incidentally related to the present invention, they will not be discussed in detail. The present invention involves the primary suspension system which includes the springs 18, 20, 24 and 26. This system will be described in detail in connection with *Figures 3 and 4*.

80 *Figures 3 and 4* are somewhat similar, with *Figure 3* showing the various parts completely disassembled whereas *Figure 4* shows most of the parts assembled.

85 Referring to *Figures 3 and 4*, the vertical springs 18 and 20, which may be elastomeric or coil type springs, include top openings 28 and 30 adapted to receive pin-like elements 32 and 34 within the side frame 12. In like manner, the bottom of the springs 18 and 20 include openings 36 and 38 adapted to receive pins 40 and 42 respectively. The purpose of the various openings and pins is to guide the springs 18 and 20 and to maintain it in place within the side frame 12 so that when they expand and contract, they will not rub against the side frame.

95 The pair of springs 24 each include pin like elements 44 and 46. The pair of springs 26 likewise include end pin-like elements 48 and 50. In an assembled position, the various pins are disposed to enter openings in the journal housing 22 and lower support housing 52. Only one such opening for receiving the pins 48 is illustrated in *Figure 3*, this being the opening 54. If required, shims may be added to provide tram in the journal housing bearing 100 22. The pin elements 50 are disposed to enter into a pair of openings of which only the opening 56 is illustrated in *Figure 3*. The lower support housing 52 also includes a portion having openings 57 and 58 for receiving the pin elements 44 of the springs 24.

110 The journal housing retainer 22 comprises a central portion for receiving the journal bearing assembly 60. A retainer ring 62 is provided to permit the attachment of the journal bearing to the housing 22 by means of a plurality of screws such as the screw 64.

115 The housing retainer 22 includes sections 66 and 68 extending therefrom. The section 66 includes angular portions 70 and 72 and the section 68 includes angular portions 74 and 76.

120 The lower support housing 52 is adapted to receive the housing retainer 22 and the various connected parts and is adapted to be connected to the side frame 12 in a well known manner by means of nuts and bolts 78 and 80, for example. The lower support housing 52 includes end angular sections 82 and 84 adapted to receive the pins of the pairs of springs 24 and 26. In operation, these springs are generally installed in a compressed condition. The pairs of springs 24 and 26 are basically elastomeric members having metal strips therein at spaced

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intervals. This provides the necessary shearing and compression in accordance with the design of this system.

One of the main advantages of the primary suspension system illustrated is that there are no wear surfaces. All the motions taking place in the primary suspension system are taken up with the shearing and/or compression of the various control springs including the vertical springs 28 and 30 and the pairs of angularly disposed springs 24 and 26.

A second advantage in the present invention is that the various spring rates for the vertical springs 18 and 20, horizontal springs 24 and 26 may be independently controlled. For example, the characteristics of the springs 18 and 20 may be changed by the composition of the material used. The spring rates of the springs 24 and 26 may be controlled by changing the angles of the spring. The angular positions of the pairs of springs 24 and 26 provide the spring rates for both the lateral and longitudinal directions.

Another feature of the present invention is that the subassembly illustrated in Figure 4, which includes the lower support housing 52 and the parts associated therewith, may be assembled in an area removed from the trucks involved.

Another feature is that the subassembly including the lower support housing 52 and its associated parts may be held in place with the wheel axle unit 10 by having it screwed in place. It may of course be easily slid off the axle 12 by just unscrewing the lower support housing and sliding it off the axle.

An advantage of the types of pairs of springs 24 and 26 is that they may be designed to have very low shear stiffness because the springs employ rubber elements and steel plates which are not unstable but marginally stable so that when you move it up and down vertically or shear the control springs, they contribute very little to the vertical stiffness.

CLAIMS

1. A primary suspension system for a railway truck having a wheel axle unit connected to a side frame, the suspension system comprising:

- (a) a retainer housing for receiving a journal bearing connected to the axle of said wheel axle unit;
- (b) a pair of longitudinally spaced vertical springs connected between said housing and said side frame; and
- (c) two pairs of angularly spaced spring elements disposed on opposite ends of said vertical springs for providing lateral and longitudinal spring controls in said primary suspension system.

2. A primary suspension system as set forth in claim 1 wherein said vertical springs comprise elastomeric springs and said two pairs of angularly spaced spring elements are disposed in a horizontal plane.

3. A primary suspension system as set forth in claim 1 or 2 wherein a lower support housing is detachably connected to said retainer housing.

4. A primary suspension system as set forth in claims 2 and 3 wherein said retainer housing and

said lower housing include angular portions for receiving said pair of horizontally disposed angular spring elements therebetween.

5. A primary suspension system as set forth in any preceding claim wherein said pairs of angular springs include positioning pins thereof disposed to fit into openings in said retainer housing and said lower housing.

6. A primary suspension system as set forth in any preceding claim wherein means are provided to secure said pair of vertical springs between said housing retainer and said side frame.

7. A primary suspension system as set forth in any preceding claim wherein said vertical springs include top and bottom openings therein disposed to fit into pin elements on said retainer housing and said side frame.

8. A primary suspension system as set forth in any preceding claim wherein means are provided to disassemble as a unit from said journal bearing said retainer housing, said lower housing and said pairs of angular spring elements.

9. A suspension system substantially as hereinbefore described with reference to the accompanying drawings.